UPPER TRISHULI-1 HEP (216MW)			
Client	Doosan Heavy Industries & Construction		
DHI's Subcontractor	Power Construction Corporation of China		
REPLY COMMENT			
Subcontractor	Power Construction Corporation of China		
Incoming Document			
Title of the Document	**Excavation and Initial Support Drawing of Adit No. 3**		
Document/Drawing No.	UT1-C-150-CVL-DG-43004 (4 sheets)	Revision	D
Review Document No.	**TJ/UT1/OUT-26**	Reviewed Note No.	**RN-0040**
Received Date	**27.12.2021**	Review status	**RR**
Outgoing Document			
Previous Reply No.	RC-0002	Previous Reply Date.	**10.12.2021**
Reply No.	RC-0011	Reply date	**21.01.2022**

General Comments

Several of previous comments of the reviewer were considered and were indicated in the drawings. However,

due to missing confirmation of the support through design calculations (e.g. rock bolt pattern, shotcrete

thickness), the drawings cannot be approved. This is primarily due to the fact that the support may still need

meaningful adjustment.

Reply: Contractor will submit the relative surrounding rock stability calculations.

It appears that the turning bay has not yet been appropriately designed. The support needs to be designed

and there is a lot to be optimized in the geometry of the turning bay.

Reply: Accept. The contractor has confirmed considering the in-site condition about mechanical equipment and transport vehicles.

It is recommended that a separate drawing is produced for the junction of Adit No. 3 with the Headrace

Tunnel. The adit needs to be enlarged to the vertical size of the Headrace Tunnel shortly before entering the

junction. This is necessary to drive the Headrace Tunnel "full face" from the junction towards upstream and/or

downstream. Otherwise, additional, time consuming reprofiling of the junction and the Headrace Tunnel at

the junction is required, which shall be avoided. Likewise, the junction needs a support that is designed for

the junction and its effective span.
Reply: Accept.

In addition, a concrete plug will be placed in the adit close to the junction - later in the project. For this reason,

it is of great advantage to open the adit to the required “plug profile” when driving the adit towards the junction.

If this is not done, the excavation profile may need to be enlarged in the section of the plug. The support of

the adit (shotcrete and dowels) may also need to be removed in this section prior to grouting and placing the

concrete plug, if this section is not opened to the “plug profile” when driving the adit towards the junction.
Reply: Accept. The plug will be arranged at near the junction. And the drawing will be submitted subsequently.

UT1-C-150-CVL-DG-43004-01 (sheet 1/4)

a) Consider revising the portal area as shown for Drawing UT1-C-150-CVL-DG-43004-02, Rev. D
Reply: Accept.

b) Provide either details of concrete plug section and junction on this drawing, or, better provide new

drawing for this area.
Reply: Accept and the new drawing will be submit subsequently.

c) Item 6: Countercheck carefully all details from mentioned drawings UT1-C-000-CVL-DG-40001-01-05

with the details provided on this series of drawings. Currently not all details of this series are complying with the details on this principal drawing set.
Reply: Accept.

UT1-C-150-CVL-DG-43004-02 (sheet 2/4)

a) There is no need to place this “perimeter drain” 2 m above the crest of the cut slope. It can be placed

straight at the crest. It is also recommended (as in previous review) to place a “cross drain” 2 m above

the portal roof. Consider and revise.
Reply: Accept.

b) There is truly no bench needed. It is difficult to construct the 2 m wide bench in rock and the bench is practically of no use. Consider and revise.
Reply: According to engineering experience, when the height of the slope reaches about 15m, it is recommended to set up a first-grade 2-m wide bench. After setting bench, the comprehensive slope ratio becomes flatter and it is beneficial to the stability of the slope.

c) Cut slope of actual portal shall be vertical.
Reply: In construction practice, the opening of the cave is cut vertically or diagonally. According to engineering experience, we believe that the slope of the opening is more conducive and beneficial to the stability of the slope.

d) There should be an option for placing steel support for the first meters of the tunnel, if required.

Indicate such option.
Reply: Accepted. Please refer to the sheet 4/4(longitudinal profile of forepoling).

e) It is unclear how the space between the ribs is filled of the Open Tunnel. Specify shotcrete thickness

and reinforcement (wire mesh, wire mesh criss-cross, wire mesh with chicken mesh?).
Reply: Considering the safety and environment, and steel mesh is set around the steel arch and 260mm concrete is sprayed. Wire mesh Ø5.5mm, C/C 100mm and shotcrete 260mm.

UT1-C-150-CVL-DG-43004-03 (sheet 3/4)

a) Revise entire drawing. Follow the drawing of the turning bay of the Investigation Tunnel (UT1-C-385-

CVL-DG-65002-04). Use also OE's review note on this drawing (RN-0038).
Reply: Accept.

b) Optimize geometry of the turning bay (here reduce length of the bay, see your drawing UT1-C-385-

CVL-DG-65002-04).
Reply: Accept. The length of the bay has revised according to the in-site condition.

c) Dowels at end wall should be optional.
Reply: Accept. The dowels will be set when necessary.

d) See notes below.

Support pattern	Class Ⅰ	Class Ⅱ	Class Ⅲ	Class Ⅳ	Class Ⅴ
Rock mass quality	Q>40	10<Q<40	4<Q<10	1<Q<4	Q<1
a Rock bolt	Spot bolting D25,L=3m (where necessary)	Spot bolting D25,L=3m (where necessary)	Pattern bolting D25@2.0m,L=3m (alternative)	Pattern bolting D25@1.5m,L=3m (alternative)	Pattern bolting D25@1.0m,L=3m (alternative)
b Shotcrete	–	T=50mm(PFRS)	T=80mm(PFRS)	T=100mm(PFRS)	T=160mm(PFRS)
c Steel support	–	–	–	–	MB150@1.0m or (lattice girder,@1m)
Supplementary support	–	–	–	Forepoling grouted dowel, D25@0.4m, L=6m (where necessary)	Forepoling grouted dowel, D25@0.4m, L=6m
d ed span for shortcrete & rock dowel(m)	–	9.4	5.7	3.8	2.5
e upported span for steel suuport(m)	–	–	–	–	0.5~1.0
f Excavation span(m)	3	3	2	1.5	0.5~1.0
Note:It is evident that the maximum unsupported span is a guideline,only and needs continuous adjustment to the prevailing rock conditions and construction requirements at the spot. g					

a) The dowels shall be as on approved design calculations. Class II requires systematic pattern.
b) Shotcrete thickness shall be as on approved design calculations.
c) Steel support in Class IV is “where necessary”.
d) Compare with your drawing UT1-C-385-CVL-DG-65002-01. Use also OE’s review note on this drawing (RN-0038).
e) Define this also for Class IV.
f) Class IV is 1.0-1.5 m.
g) Delete this note, as it is anyway “evident”.

Reply: a) The calculation of surrounding rock stability will be submitted subsequently. According to the contractor’s engineering practice, partial block loss is allowed in surrounding rock class II. In order to prevent local block loss, the contractor uses random anchor dowels according to the actual situation.
b) Accept.
c) Accept.
d) Accept. The contractor will consider the review note.
e) Accept.
f) Accept. Class IV is revised to 1.0~1.5m.
g) Accept.

UT1-C-150-CVL-DG-43004-04 (sheet 4/4)

a) Indicate “Shotcrete, 50 mm, where necessary” in Class I.
Reply: Accept.

b) Systematic dowels are necessary in Class II. Shotcrete liner over whole perimeter of tunnel is required.
Reply: Empirical analogy is the practical method in the tunnel design, according to Contractor’s experience of designing and construction, systematic dowels are not necessary in Class II, and the shotcrete in top arches and side walls.

c) Indicate inner shotcrete liner as concrete liner is omitted.
Reply: The inner shotcrete liner has already indicated.

d) Provide a note, that the excavation profile may need to be adjusted to a “saw-tooth profile” and size

of ribs/girders may also be adjusted.
Reply: Accept.